

# ARTIFICIAL WARMTH

AND

## VENTILATION,

AND THE

MODES BY WHICH THEY ARE PRODUCED.



CONTAINING, ALSO, A DESCRIPTION OF

BAKER'S IMPROVED LOW-PRESSURE SELF-REGULATING

STEAM

WARMING AND VENTILATING

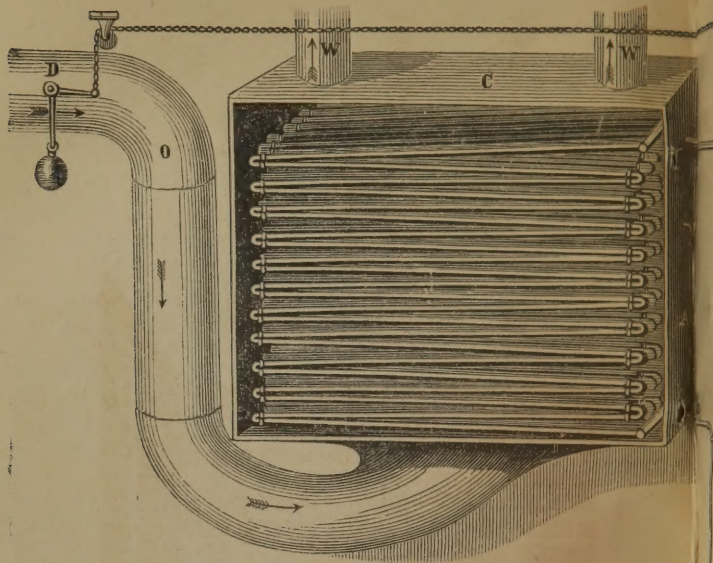
APPARATUS,

FOR PRIVATE DWELLINGS, &C.

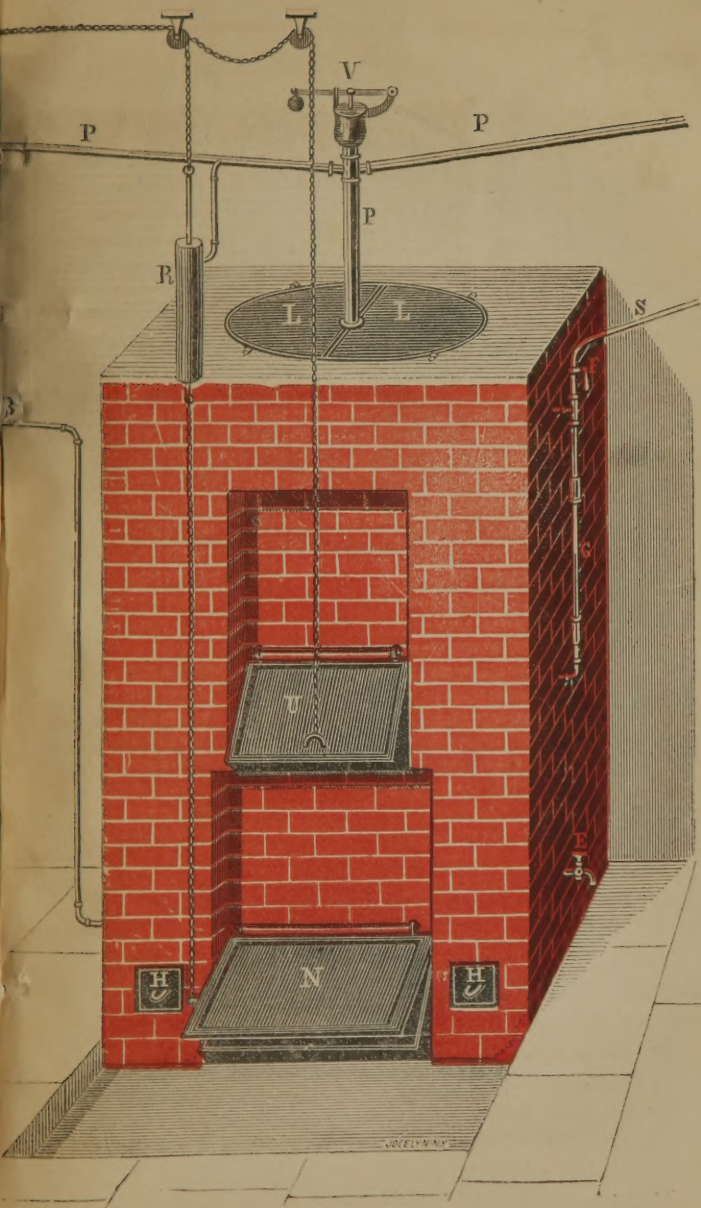
MANUFACTURED AND ERECTED SOLELY BY

**BAKER, SMITH, & CO.,**

Nos. 180 & 182 CENTRE ST., NEW YORK.



- U, feed-door for the fuel.  
 N, ash-pit and draft-door.  
 L L, lids to be lifted for sweeping the flues.  
 H H, holes to be opened to remove the sweepings of the flues.  
 E, valve whereby the water may be drawn from the boiler.  
 G, glass-gauge that shows the height of water in the boiler.  
 S, supply-pipe for water to the boiler.  
 F, faucet in the supply-pipe.  
 P P P, pipes leading from the boiler to furnish the heating-surfaces with steam.  
 V, safety-vent that opens directly out of the boiler.  
 R, regulating-cylinder that operates the two doors on the boiler, and the damper in the cold-air duct.  
 C, chamber of the heating surface.  
 W W, warm-air conductors from the hot-air chamber.  
 O, cold-air duct for outside air to enter.  
 D, damper in cold-air duct.  
 A, air-valve which closes when the steam presses the air out of the heating-tubes.  
 B, pipe that conducts the condensed water back to the boiler.







# **BAKER'S IMPROVED LOW-PRESSURE,**

SELF-REGULATING

## **Steam-Heating & Ventilating Apparatus,**

FOR WARMING AND VENTILATING

PRIVATE DWELLINGS AND OTHER BUILDINGS.

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### **DESCRIPTION.**

This apparatus consists, 1st, of a Boiler, neatly set in substantial masonry of brick-work, located in the cellar or some lower room. It has a simple automatic arrangement, which, by the variation in the pressure of steam, regulates the fire exactly to the amount of heat required. It also regulates the admission of air through the cold-air duct.

2d, Heating Surfaces of the best wrought-iron or cast-iron tubes, generally one inch in diameter, and of length varying according to circumstances. These are coiled in sufficient quantities within a chamber, or chambers, of wood lined with tin. They are connected with the boiler, but are usually situated directly under the various rooms to be warmed,

3d, Cold-air Ducts, or flues through which a copious supply of pure external air is conducted into the chamber, to be warmed by the tubes. From thence the warmed air flows upwards through tin or wooden flues into the space to be warmed, where registers may be turned to graduate the heat as desired.

Every part of the entire apparatus is constructed of the strongest and most durable material, and erected in the most thorough and workmanlike manner, and warranted. Nothing that is liable to get out of order is admitted. There are no valves or dampers to require attention.

The boiler is upright, tubular, and the water surrounds the fire on every hand. It is constructed of the best wrought-iron, one-fourth of an inch in thickness. The boiler and all the connecting tubes are tested under a hydraulic pressure of two hundred lbs. to the square inch; while the working pressure *is limited to five lbs. per square inch*. At the pressure of five pounds, the boiler is at once opened to the external atmosphere, through a large vent, which cannot possibly allow the steam to accumulate to exceed this limit.

No part of the brick-work comes in contact with the boiler, to injure it, or interfere with the fire-surface and the sweeping of the flues. The tubes of the boiler are large, and can be easily got at to clean, at any time, by lifting the iron lids that cover the top of the boiler and the flue around it.

The engraving on the first page represents the boiler set in brick-work, with the regulating fixtures, and a cluster of heating tubes attached. In large houses, more than one cluster may be necessary, in order to have them as nearly as possible *directly under* the rooms to be warmed, thus avoiding the long and unequal

horizontal lengths of pipes which prevent the uniform and easy flow of heat into the apartments.

In buildings where the heating surfaces cannot be conveniently situated below, or where ventilation can be dispensed with, they can be neatly arranged within the rooms to be warmed, and covered with a handsome screen, &c.

### REMARKS.

Mr. Baker has for many years devoted his entire personal attention to the application of steam for warming purposes, especially in Private Residences, and having thoroughly investigated every heating arrangement of any note, he is assured that he not only appreciates the necessity existing in this department, but is qualified to judge of the relative merits of the different modes. With this knowledge he is warranted in asserting that the plan which is here introduced to the public—the result of long experience and many experiments—is the simplest possible form of adaptation of steam for warming purposes.

This plan has also received the approval of the oldest, the most experienced, and the most skilful operators in steam-heating in the United States.

While Mr. Baker claims for his apparatus a decided superiority, in many particulars, over any other, yet he does not present it to the public as in any respect an *experiment*. Every feature of it that might, to those not conversant with such matters, assume an objectionable aspect, has, by him and others, been satisfactorily tested under almost all imaginable circumstances and conditions. Would space permit, we could here give the names and recommendations of hundreds who have



used steam for years in their dwellings—left wholly to the care of servants, and under more objectionable conditions than can possibly be attributed to this apparatus.

Particular attention will be given to the warming and ventilating of Private Dwellings. It can be put into houses already built, without inconvenience to the occupants, and with very little alteration. In most instances, where hot-air flues are in, the same can be used for this mode.

While every part of the apparatus shall be of the *best*, both as regards *durability* and *finish*, the *price* shall be low, and within the reach of all.

We wish it to be distinctly borne in mind THAT EVERY ESSENTIAL FEATURE OF THIS APPARATUS IS DIRECTLY OPPOSITE TO THE OLD-FASHIONED HIGH-PRESSURE FORM OF STEAM HEATING, as explained in another part of this book. Nothing can be more apparent than this upon an examination of our system.

With regard to its features of *safety*, we will here remark, that independent of the perfect control of the fire, which we accomplish—independent of the large and reliable escape for all accumulation of steam above a very slight pressure—independent of the enormous pressure which every part of our apparatus is *capable* of sustaining—each of which is a reliable safeguard—we *attach to every boiler, without any opportunity of being shut off, a sufficient quantity of steam-condensing surface to dispose of all the steam the boiler is capable of making.* This, in point of safety, is equivalent to having the steam carried off into the open air as fast as generated. We will further remark, in this connection, that owing to the great success of Mr. Baker in warming by low-pressure steam during the past six years, certain unpracticed parties have made some bung-



ling attempts to imitate him. They have even, by a species of pilfering, trickery, and by false representations, obtained our patterns and castings, to facilitate their abortive operations. The public are respectfully cautioned against such impostors; and we here state that we have secured *the exclusive patent right* to every important part of our arrangement, without the infringement of which no one can put up a successful apparatus. We shall prosecute, to the extent of the law, each and every infringement upon our rights.

For further particulars relating to this apparatus, and its application to heating buildings, especially Private Dwellings, we ask a careful perusal of the following Treatise on Warmth and Ventilation.

BAKER, SMITH & CO.

182 CENTRE STREET, }  
New York, July, 1860. }

GEORGE DAYTON, Esq., Peekskill, N. Y.

\* THIRD REFORMED PRESBYTERIAN CHURCH, 23d Street, near Eighth Avenue, N. Y.

W. T. MILLER, Esq., 5 Hanover Street, N. Y.

ANDREW C. BOWDEN, Esq., 6 Hubert Street, N. Y.

\* NEW METHODIST EPISCOPAL CHURCH, Mamaroneck, N. Y.

JOSIAH P. KNAPP, Esq., 43 Murray Street, N. Y.

### RECOMMENDATIONS.

We give below a few letters received from parties who have thoroughly tested our apparatus.

METROPOLITAN BANK, New York, April 19, 1860.

MESSRS. BAKER, SMITH & Co. :—

GENTLEMEN: The Steam Warming and Ventilating Apparatus erected by you in my house at Mamaroneck has been used and thoroughly tested during the past winter.

It is all you represented it to be. We have had an abundance of pure warm air in the coldest weather, and my family are delighted with the comfort produced by it. I think it a decided success, especially as my house is one of the most exposed in Westchester County. I consider it perfectly safe in every respect, durable in construction, economical in fuel, and the best warming arrangement with which I am acquainted.

Yours, etc.,

GEO. I. SENEY

NEW YORK, May 26, 1860.

MESSRS. BAKER, SMITH & Co. :—

GENTLEMEN: You ask my opinion of your Mr. Baker's system of Warming and Ventilating, as compared with others, and I most cheerfully comply, and if any thing I can say will induce a single family to avail themselves of it, or any school committee to adopt its use, I shall feel that I have been of service to such.

I have given the subject of warming and ventilating much attention, and from experience I unhesitatingly say that *steam as ap-*

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\* These we believe to be the first churches warmed by steam.

*plied by your plan* is at once the most safe, convenient, effectual, and healthful of any or all modes of producing artificial heat that I have examined.

The health of my family has for a number of years been such as to induce me to spare no pains or expense to secure the most healthful and effectual system of heating my dwelling, and I have used various kinds of hot-air furnaces, and discarded them all in turn, on account of their pernicious influence upon health, to say nothing of the wasteful and extravagant use of fuel. I believe it is impossible to construct a hot-air furnace so that it will be free from dust, gas, and smoke, or to manage one so that it will not destroy the vitality of the air by passing over an over-heated surface.

Since I have adopted the use of your plan, all these objections are obviated. The heating surfaces are so far removed from the heating source that it is impossible to contaminate the air with these deadly influences, and as the heating surface is never greater than about  $212^{\circ}$ , the air must remain pure.

Another and very important feature in your apparatus is its perfect self-regulation, giving out heat in just the quantity desired, and at the time it is needed, without depending upon the servants or others, and thus economising in fuel, and adding to the comfort of the family.

The hot-water apparatus in its best mode of application is one step in the right direction. Still it is accompanied with objections which unfit it for domestic use.

It is impossible in a communication of this sort to hint at all the points of excellence of the one, or the objections of the other; suffice it to say that in my opinion, when the value of pure air is fully appreciated, your "Low-Pressure Steam Heating Apparatus" will as surely supersede all other methods of warming and ventilating, as gas now does that of other artificial light.

Very respectfully yours, etc.,

A. S. JEWELL.

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MANHATTAN SAVINGS INSTITUTION,  
644 Broadway, cor. Bleeker, St.,  
New York, June 22d, 1860.

Messrs. BAKER, SMITH & Co. :—

GENTLEMEN: You request my views on the merits and demerits of the Steam Heating Apparatus you put up in my house, which I

cheerfully give, since it meets with my entire approval. Demerits (if put up as *you* have put up mine) it has none, so far as I can discover with very close attention during the period it has been in operation in my house, both in very cold and mild weather.

The substantial character of the whole work, its easy regulation at the boiler, freedom from all danger in its use, good ventilation, and pure air, make it, in my opinion, the best heater for private dwellings now in use.

I have used the most prominent hot-air and hot-water furnaces, have discarded both, and now feel satisfied.

Respectfully yours, etc.,

A. A. ALVORD.

PEEKSKILL, May 2d, 1860.

MESSRS. BAKER, SMITH & Co. :—

GENTLEMEN: Your improved Low-Pressure Steam Warming and Ventilating Apparatus, put up in my dwelling last fall, in place of a hot-air furnace, so fully demonstrates all that you promised for it, that it gives me pleasure to volunteer my testimonial of its superior merits."

Durability of material, permanency of construction, agreeableness of appearance, simplicity of mechanism, ease of management, freedom from all danger, economy in fuel, and, above all, the purity, healthfulness, and even distribution of the air in the apartments warmed and ventilated by it, are, in my experience, qualities of excellence not be found in any other warming apparatus of the age.

A very noticeable feature of your apparatus or system is its ability to warm rooms at a very remote distance from the furnace, or rather the *boiler*—rooms in the extreme L of my house, some hundred feet horizontally from the boiler, and where my water-pipes have heretofore given trouble by freezing, are now effectually, and in a few seconds, as readily warmed as those within a few feet. We find your steam arrangement in the drying-room, also located in the extreme of the L, most efficient, neat, and convenient for drying clothes. You locate your warming surface in various stacks, not within the rooms, to disfigure them, but directly beneath each separate register through which the warm air is supplied. In heating power your arrangement is equivalent to having a hot-air furnace



under each room, while you obviate the gas, smoke, ashes, and other poisonous and disagreeable escapements, so inseparably connected with the use of hot-air furnaces.

No exterior currents of air affect the operation of your apparatus in any way. Let the wind blow high or low, east, west, north, or south, the same equable, efficient, balmy atmosphere pervades my entire house, although built of wood, and fully exposed on all sides—one room in particular we could not warm at all with the hot-air furnace, when the wind was in a particular direction.

The principles which you adhere to, of locating your heating surface remote from the fire and its attendant gas, ashes, dust, etc.; of having those surfaces at points where the warmth is actually wanted, and of limiting them to a low but *unvarying* temperature; of admitting, by a self-regulating process, that amount of air only that is required for the combustion of the fuel, and of supplying to the various warm-air chambers only that amount of external air which the heating surfaces are capable of warming to a proper degree; not admitting cold or partially warmed air through the registers are, in my opinion, *invaluable*.

I deem it a duty, as well as great pleasure, to recommend you and your system of artificial warming and ventilating to my friends and the public.

Very truly yours, etc.,

GEO. DAYTON.

PEEKSKILL, April 23d, 1860.

GENTLEMEN:—In reply to your enquiry as to the operation of the Steam Warming and Ventilating Apparatus, I am glad to be able to say that we are much pleased with the mild summer-like atmosphere produced by it, and believe it superior to other arrangements in use, both on account of safety and healthfulness. I think it peculiarly adapted to invalids suffering from pulmonary affections, as my husband, though a confirmed invalid, frequently remarked that he breathed more comfortably than he had done in previous years, and believed that he had transferred to his own house the genial air of a more southern clime.

Very respectfully yours,

Mrs. GEORGE F. HUSSEY.

OFFICE OF I. M. SINGER & Co.,  
Cor. Broadway and Grand St.,  
NEW YORK, May 3, 1860.

MESSRS. BAKER, SMITH & Co. :—

GENTLEMEN: As I. M. Singer & Co. entrusted me to procure a suitable apparatus for warming their show-room and offices, I spent considerable time in ascertaining the best contrivance for this purpose. The low-pressure steam apparatus which you have constructed for them, has been in the most successful operation since last fall, and has given complete satisfaction in every particular.

The apparatus is very simple, requires but little care in its management, is perfectly noiseless, and readily adjusted to any required temperature. The heating surfaces occupy no available room either in the store or basement. This is deemed an important consideration where space is so valuable.

The store of Messrs. Singer & Co. is an unusually cold one, being situated on the north-east corner of the street, with two front-ages, nearly all of which are glass. It has two large single doors, which are constantly being opened and shut. Still your apparatus has supplied an abundance of heat, in the coldest weather, with a consumption of only 12 tons of coal.

The size of the store is 90 by 26 feet, and 14 feet high.

I am fully authorized by Messrs. Singer & Co. to say that they are greatly pleased with the heating apparatus with which you have furnished them.

GEO. ROSS MCKENZIE.

NEW YORK, April 21, 1860.

MESSRS. BAKER, SMITH & Co. :—

GENTLEMEN: In reply to your request to know from us the degree of satisfaction attained in the use of the Steam Heating Apparatus, furnished by you for the Third Reformed Presbyterian Church, we say that it has fulfilled all that you agreed that it should accomplish.

When the question "How shall the Church be heated" was being discussed by the Building Committee, a most thorough examination was instituted into the several modes of producing artificial heat—hot-air furnaces were found to be cheap in their first cost—these, a large experience found and inquired into, and

fully examined, had demonstrated to be *expensive* in their consumption of fuel, *dangerous* to the safety of buildings in their operation, and extremely unhealthful in the atmosphere heated by them. Hot-water apparatus *uncertain* in their operation, in many cases, after some use, to impart a peculiarly unpleasant odor to the atmosphere warmed, and to be liable to freeze. Steam heating was therefore adopted, as we believe, only after the most thorough investigation into its merits for *safety* against fire, and healthfulness, from the purity of the atmosphere warmed by it, with judicious ventilation.

The plans of other parties who insert apparatus for heating by steam received a large share of attention; and yours was adopted because the ideas embodied therein were believed to be the most economical and comfortable—economical in the construction, and in the conducting of the apparatus as to the time and attention required for its operation, and comfortable, particularly as it relates to supply of fresh or unvitiated air—these expectations have been clearly realized. The apparatus is most easily managed, and under perfect control. The church (or main audience room) and lecture room are heated comfortably, say to 60 or 65 degrees of Fahrenheit, in from six to eight hours from the time of lighting the fire, and this with coal which has proved to be of very poor quality, from the quantity of clinkers and slate found in the residuum; and, with the disadvantage of a chimney with a poor draft. On enquiry, we found that other churches required their fires to be burning for from 24 to 30 hours to make the temperature comfortable.

The congregation have expressed great satisfaction with the comfortable state of the atmosphere in the church during the public services; and strangers who have been present have expressed their comfort and pleasure in relation to this matter, with remarks such as—"The air in your church is very pleasant."

Believing that really a great blessing is conferred upon the community by the introduction of your Steam Heating Apparatus,

We remain, very truly, yours,

W. T. MILLER,  
A. C. BOWDEN,

COMMITTEE ON HEAT AND VENTILATION OF  
THE THIRD R. P. CHURCH, 23d St., N.Y.

MAMARONECK, N. Y., April 20, 1860.

Messrs. BAKER, SMITH & Co.:—

GENTLEMEN: When we built our new Church, we decided to have the best warming arrangement that could be procured, as we considered the quality of the atmosphere which our congregation was to breathe of the first importance. After making a careful examination of the various modes of warming and ventilating, we adopted your system; and have found that it is practically all we anticipated and all you promised—which was a great deal.

We had it in operation through the coldest weather of the past Winter. It is efficient, simple, safe, substantial, economical, and, above all, yields an abundance of evenly distributed and summer-like warmth in the church.

We cheerfully recommend it to our brethren as the best mode of warming all places of public worship.

SCHUREMAN HALSTED,  
JOSIAH P. KNAPP,  
BUILDING COMMITTEE OF M. E. CHURCH  
AT MAMARONECK, N. Y.



REPORT OF THE SPECIAL COMMITTEE

OF THE

Board of Education of Jersey City.

Adopted June 11, 1860.

*To the Board of Education:—*

GENTLEMEN: The Committee to whom was referred the matter of inquiry as to the expediency of abandoning the use of the present heating apparatus in School No. 2, and adopting Messrs. Baker, Smith & Co.'s, or some other *low-pressure steam* heating apparatus, *beg leave to report*, that

Your Committee being impressed with the importance of the subject which they were called upon to investigate, and the responsibility resting upon them in recommending a change involving so large an expenditure as the resolution contemplates, entered upon their duty with an earnest desire that they might be able to arrive at correct conclusions, and recommend such changes, if any, as would conduce to the best interest of the city, both in a pecuniary point of view, and in regard to the health and comfort of the teachers, and youth entrusted to their care.

The warming apparatus in School No. 2, which is an ordinary hot-air furnace, your Committee unhesitatingly pronounce entirely inadequate to the work demanded of it, and unsuited in every particular to warm and ventilate a building where so many children are as-

sembled, even if the materials and workmanship had been of the best of its kind, but this your committee feel warranted in saying is not the case.

There are in the minds of your Committee insuperable objections to all hot-air furnaces, even when they give out sufficient heat—such as contaminating the air, which is so important to health, with dust, smoke, and gas; but the furnaces under consideration cannot be made to heat the building satisfactorily under the most favorable circumstances. In the coldest weather they are urged beyond their capacity, and in doing this burn out the heating surface, open seams and cracks, and let out into the heat chamber dust, smoke, and gas to a stifling degree; and at the same time are destructive to fuel, and endanger the lives of the pupils by risk of firing the building.

From these facts your Committee recommend that they be removed, and that other and more efficient, economical, and healthful mode of heating be substituted.

In order to intelligently and confidently recommend some other plan, your Committee resolved to visit a number of the largest public and private buildings artificially heated in New York City, and see the different systems of warming and ventilating in *actual* operation, and thus be able to judge of their merits, and recommend the mode with the fewest objectionable features.

Your Committee first called at the store of Messrs. I. M. Singer & Co., Broadway, which is heated by one of Messrs. Baker, Smith & Co.'s "*Low-Pressure Steam Heating Apparatus*." This was exhibited by Mr. McKenzie, agent for Messrs. Singer & Co., who testified as to the amount of fuel consumed—being about the same as an ordinary cylinder stove—to the ease with which the apparatus could be adjusted to any required

temperature, to the perfect self-regulating of draft, and to the entire safety under any circumstances; and, also, that it gave entire satisfaction to the proprietors, and to all concerned.

Your Committee next visited Ward School No. 10, in Wooster street. This building is four stories high, 32 feet front by 100 feet deep—with four wings—and is warmed by four hot-water furnaces, put in by "*Brown's Water Furnace Company*." This apparatus seemed to do the work well; but it appears to be expensive in construction and extravagant in working. The Janitor stated that he had to make his fires three or four hours before the heat was available, causing him to light his fires at two o'clock in the morning in order to have the building sufficiently warmed by school-time; and that the fire had to be continued during Saturdays and Sundays to prevent the water from freezing in the pipes.

The regulating apparatus does not control the draft properly, and the amount of fuel consumed per year was 100 tons of coal and a *large* quantity of wood—how much he could not say, as they had plenty at hand, and he used all that he wanted.

There was the usual vacation of one week, and during that time they used the furnaces only to prevent them from freezing.

The ventilating arrangement is confined to the lower part of the room.

Your Committee next visited Primary School No. 24, in Horatio street, (9th Ward.)

This building is two stories high—main building is 36 feet front, 87 feet deep—with four wings, 17 feet by 22 feet each. This building is heated by four of Leed's Patent Hot-Water Furnaces, erected by Geo. L. Cannon.

We learned from one of the Trustees of this school "that this apparatus was very deficient in heating power"—and "that payment had been withheld—but that recently there had been some alterations made, and that since which it had done better, so that now most of the building was sufficiently warm, except in very cold weather."

The heating surface of this arrangement is octagonal flues containing strips of iron, located over the fire, and within the same enclosure as the fire. We found one of these hot-air chambers filled with curled sheet iron to retain the heat. The flues of the heating surface seemed to be filled with dust, also the register tubes, and we should judge that the dust would be carried up to the rooms should there be sufficient current of hot air passing up to warm the building.

About 60 tons of coal are consumed during the winter. We could see no arrangement for regulating the fires.

Next in order, your Committee called at School No. 16, in 13th street, (9th Ward.) This building is three stories high—main building 42 feet front by 30 feet deep, with rear building 20 feet by 16 feet—and is warmed by two of "*Gold's Steam Heating Apparatus*."

This plan consists of sheet-iron radiators placed against the walls in the different rooms, to which the steam is applied from two boilers beneath. The air in these rooms is heated over and over, and must become very foul—and there seems no method of ventilation—a cold-air register is placed in the floor, and an escape in the ceiling—and when we went into a class-room, the teacher had the window pulled down, and the floor register closed, and said she preferred to ventilate in that way rather than through the register in the floor designed for that purpose.



The amount of coal used by this apparatus we could not learn, but should judge it to be economical.

The next visit your Committee made, was to Ward School No. 21, in Marion street, (14th Ward.) In the basement of this house we found *five* of "Harrison's Combination Furnaces." This Heater seems to be a cross between an old-fashioned hot-air furnace and a hot-water concern—a kind of mongrel. The apparatus consists of a hot-air furnace, and a coil of hot-water pipes enclosed in the same chamber.

The amount of coal consumed per annum, we learned from the Janitor to be 120 tons. Your Committee were now impressed with the fact that all the hot-water furnaces which they saw had all their fires burning with the greatest intensity, and that the consumption of fuel must be very great—and it seemed to make no difference as to the state of the weather. The fires were kept up to the greatest capacity.

It is proper to state that these heating arrangements your Committee examined, and report upon as above, are the only ones yet introduced which claim to be superior to the ordinary hot-air furnaces, and, as we have been informed, are the best specimens of the kind ever erected.

The buildings were all nearly new, and we were much pleased with the appearance of the schools and buildings, and wish here to mention the courtesy shown us by the parties of whom we made enquiries; every facility was offered us to examine all parts of the buildings, and our enquiries were cheerfully and promptly answered.

After investigating this subject thus thoroughly, and giving it a very careful consideration, your Committee are convinced that the Baker & Smith "Low-Pressure Steam Heating Apparatus" has the decided preference

over any other that they have examined—for the following reasons, which they think will be fully established upon any trial or investigation :—the advantages are found in economy of *durability of material*, and *construction*, in entire safety from explosion, self-regulating, ease of management, freedom from dust, gas, and smoke, *even and quick* in operation, sending the heat to all the rooms at once, efficient in ventilation, and nicety of adjustment to any required temperature. It occupies but small space, and is economical in the consumption of fuel.

The heat from this apparatus being perfectly free from all impurities, is peculiarly adapted to delicate lungs and sickly children.

Another important feature in this apparatus, is its entire safety from fire. The boilers are set in such manner that it is quite impossible to set the building on fire by the most careless management. The heating surface is so far removed from the power to produce the heat, that it is not possible to produce any of the unpleasant effects that are caused by other modes of heating.

Much more might be said in behalf of this system of warming and ventilating, but your Committee deem this sufficient; but would refer to the subjoined extract from a lecture by Professor E. Y. Robbins, delivered at the Cooper Institute, on the subject of ventilation as influencing health and longevity.

From all of the foregoing facts, which your Committee are confident can be established to the satisfaction of every member of this Board, they recommend that measures be taken to introduce a *Messrs. Baker, Smith & Co.'s "Low-Pressure Steam Heating Appa-*

*ratus* " into School No. 2 at as early a day as shall be deemed expedient.

All of which is respectfully submitted.

Signed,

A. S. JEWELL,  
JOHN GRIFFITH, } COMMITTEE.  
JAMES FLEMING, }

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*Ventilation as Influencing Health and Longevity.*—Professor E. Y. Robbins delivered the second of his course of lectures on "Sanitary Science," at Cooper Institute, March 22d, 1860. His subject was, "Ventilation as Influencing Health and Longevity." He commenced by saying, that air was the prime necessity of life—that we could live more days without food than we could minutes without air. The purpose of our breathing was, first, to supply the blood with oxygen, which is the life-sustaining principle of the air; and second, to free the blood from carbonic acid and other impurities. The air which we breathe is found on expiration to have lost a large part of its oxygen, and to be impregnated with carbonic acid gas—that substance which often proves fatal to persons who descend into wells, and which is the active agent of death in cases of suicide by burning charcoal. It produces death whether retained in the blood or inhaled into the lungs—the poisoning process in both cases being precisely the same. To produce death by that agent, it was by no means necessary that it should be breathed in its pure state. Dr. Carpenter had ascertained that air containing five or six per cent. of carbonic acid gas would produce immediate

death, and less than one half that quantity would soon prove fatal; and Dr. T. Herbert Barker had ascertained by experiments with this substance, that an animal in an atmosphere containing only two per cent. of carbonic acid, would die in about two hours. Now, the air which we exhale from the lungs contains, according to standard authorities, about five per cent. of carbonic acid; and hence, if exactly the same air were re-inhaled, it would quickly prove fatal. It is a substance that is constantly accumulating in the blood, and if it is not as constantly removed, it will speedily produce death. The process of breathing is but the instinctive effort of nature to free herself from this poison. But air which has once been in the lungs will no longer perform this office, being already saturated with carbonic acid. Hence the necessity of inhaling fresh air at every breath. The importance of this was illustrated by Dr. Southwood Smith, who said: "Stop the respiration of an animal, or confine it to air which has already been respired, and carbon accumulates in the venous blood, and mixes with the arterial blood. In half a minute the blood flowing in the arteries is evidently darker; in three quarters of a minute it is of a dusky hue; and in a minute and a half it is quite black. Every particle of arterial blood now disappears, and the whole mass becomes venous, sensibility is abolished, and the animal falls down, and in three, or at most in four minutes, the heart entirely ceases its action, and can never again be excited."

Now, if effects are proportioned to their causes, and if an atmosphere impregnated with five per cent., or one-twentieth part of its volume, of carbonic acid, will thus produce death in a few minutes, what must be the probable effect of breathing, for twenty or forty years, even the much minuter proportions which must be present in



every inhabited room where there is not a constant ingress and egress of air ?

It must lower the standard of health, and shorten the duration of life. But not only is the air in a close room thus constantly being impregnated with carbonic acid gas to the amount of about twenty-eight cubic inches per minute for each adult man occupying such room, but there is also, according to the best authorities, constantly being discharged by the lungs and pores of the skin an equal amount, by weight, (that is, about three or three and a half pounds in twenty-four hours,) of effete, decaying animal substances, in the form of insensible vapor, which we often see condensed in drops upon the windows of crowded rooms and railroad cars. These drops, if collected and evaporated, leave a thick, putrid mass of animal matter. The breathing of these exhalations is believed to be quite as efficient in producing disease as carbonic acid itself. But there is still a third deterioration produced in the air by respiration, and that is the loss of its oxygen. Oxygen is the vital and life-supporting principle of the air ; and it is found that when the air enters the lungs, the blood absorbs about forty per cent. of the oxygen which it contains.

It is upon this we live ; and the air that is exhaled being deficient by almost one-half, in this vital element, of course can no longer support life. And as we inhale about 500 cubic inches of air every minute, we of course deprive that quantity of air of forty per cent. of its oxygen each minute. The Creator has provided for the constant and complete removal of these poisonous exhalations, by causing the expired air to rise, by its increased warmth and consequent levity, quickly above our heads, and beyond the reach of a second inhalation, and by sweeping it

away by the winds; but by our impervious ceilings and tight walls, we obstruct the operation of this beneficent law, and prevent those poisonous exhalations from escaping. Hence the air of a close room, though occupied but by a single person, becomes, from the very first moment of occupancy, impregnated with these impurities, which accumulate more and more, the longer it is occupied without ventilation, and the more it is crowded.

It certainly would be difficult to overestimate the importance to life and health the purity of the air we breathe, and it would also be difficult to determine to what period of duration human life might be prolonged, did we, and had our ancestors always breathed a perfectly pure atmosphere. A most remarkable and convincing illustration of the effects of the quality of the air we breathe upon health, is to be found in the experience of the armies of England and France during the late Russian war. England, out of a total force of 93,959 men engaged in the campaign in the Crimea, lost 33,645, of which number only 2,658 were killed in action, and 1,761 died of wounds, while no less than 16,298 died of disease at the seat of war, and about 13,000 were sent home on account of sickness, many of whom, no doubt, afterwards died. To every *one* taken to the hospitals on account of wounds, *twelve* were taken there on account of disease. The chief destroyer was typhus fever. M. Boudens, Surgeon-in-chief of the French army, in a letter written home during the war, says of this disease:—"It is engendered by crowding and want, either in hospitals, prisons, or on board of vessels. The disease may, indeed, be called forth, or removed at will." And he adds, "The first remedy is pure air and powerful ventilation." The greatest mortality in the English army was during the early period of the war; after the sanitary commissioners

arrived, and commenced their operations by securing greater ventilation, the sickness was stayed, and finally disappeared. The great panacea was fresh air. In the French army, where no sanitary reforms were introduced, the great mortality continued, and increased, thus showing clearly that the changes made by the sanitary commissioners in the English army were the sole causes of the decrease of mortality where they labored. Recurring again to our buildings here, the lecturer said: In our school-rooms the matter is still worse; while in our railroad cars we have actually less breathing room than the wretched prisoners in the black-hole of Calcutta—they having had about forty cubic feet per man, while in our cars we have an allowance of only about thirty cubic feet.

In addition to this, the lighting of our rooms in the evenings is a source of great contamination to the air—each gas-burner being estimated to generate as much carbonic acid gas as the respiration of four persons—or more than 100 cubic inches per minute. Every gas-burner should have a ventilating tube to carry off the products of combustion, and convey them entirely out of the room, as is the case in the Houses of Parliament, and many other public and private buildings in England.

In conclusion, he stated his belief that by due attention to sewerage and ventilation, the mortality of this city would be decreased ten thousand every year.

In answer to a call, Dr. Halliday referred to recent visits he had made to the houses in this city in which a number of families lived together. He said that the *Italian* residents here especially were in the habit of living several families together in one comparatively small room. He also mentioned that in a single block he found *forty-five* families, not a single one had a child

living; when he asked for their children, the answer generally was, "God has taken them away to heaven." This terrible infant mortality was caused by want of cleanliness and ventilation in their residences.

*From the N. Y. Evening Post.*

## A GREAT SANITARY EVIL.

"The usual modes of warming buildings are attended by many evils, which directly affect the health and lives of our families, who are obliged to remain within doors by far the greater part of the time. The entire absence of the means of ventilation in most cases, and the failures which have followed most attempts in this direction, make the subject one of the most vital importance. "Bad air is a *slow* poison; that is the trouble. People go on taking it into their lungs day after day and night after night. They grow pale, their lungs suffer, the circulation is languid, they take colds readily, the chest, the stomach, the skin become disordered, and a host of chronic diseases attack them. A little carbonic acid taken every day does not kill a man. It is almost a pity it don't.

"If a red-hot stove or furnace destroyed instantly one man in every town daily for a week there might be some salvation for the nation. If, instead of fainting away in crowded and badly ventilated public assemblies, people occasionally died outright in convulsions, the authorities would take the matter in hand, and make it penal for the owners of such buildings to open them for public use without attending to the proper conditions for the preservation of health. When a thing is only a slow poison, the age is in too much of a hurry to attend to it." Thousands of dollars are lavished on luxuries and superfluities, while the air in our dwellings is poisoned and burnt by heating arrangements whose only recommendation is that they are *cheap*. In other words, our wealthiest men are *too poor to afford pure air* for



themselves and families. The vital life element is supplied in their green-houses and conservatories regardless of expense, while scions of the human stock, buds and blossoms of immortality, are permitted to wither and decay in the sickly atmosphere produced by stoves and hot-air furnaces.

Mr. William C. Baker, of the present firm of Baker, Smith & Co., about five years since turned his attention to the subject of warming and ventilation by a simplified form of steam, and has, after thorough experience and many experiments, perfected a system which he claims will obviate all the evils above enumerated, and the objections heretofore urged against the employment of steam for domestic warming. The fact that the surface that warms the air is always located at a considerable distance from the fire, and consequently from the gas, dust, and products of imperfect combustion, is, of itself, a positive guarantee against the recurrence of the sad calamity which lately happened at Haverhill, Massachusetts, and which resulted in the death of Mr. and Mrs. Sawyer. Add to this its entire safety from fire, &c., and its advantages will be apparent to every considerate mind.

The following is a brief description of Mr. Baker's apparatus :

It consists, 1st. Of a boiler, neatly set in substantial masonry in brick-work, located in the cellar or some lower room. It has a simple automatic arrangement, which, by the variation in the pressure of steam, regulates the fire exactly to the amount of heat required.— It also regulates the admission of air through the cold-air duct.

2d. Heating surfaces of the best wrought-iron or cast-iron tubes, generally one inch in diameter, and of

length varying according to circumstances. These are coiled in sufficient quantities within a chamber, or chambers, usually situated directly under the various rooms to be warmed.

3d. Cold air ducts, or flues, through which a copious supply of pure external air is conducted into the chamber, to be warmed by the tubes. From thence the warmed air flows upwards through tin or wooden flues into the space to be warmed, where registers may be turned to graduate the heat as desired.

Every part of the entire apparatus is constructed of the strongest and most durable material, and erected in the most thorough and workmanlike manner, and warranted. Nothing that is liable to get out of order is admitted. There are no valves or dampers to require attention.

The boiler is upright, tubular, and the water surrounds the fire on every hand. It is constructed of the best wrought iron, one-fourth of an inch in thickness. The boiler and all the connecting tubes are tested under a hydraulic pressure of two hundred pounds to the square inch; while the working pressure *is limited to five pounds per square inch*. At the pressure of five pounds, the boiler is at once opened to the external atmosphere, through a large vent, which cannot possibly allow the steam to accumulate to exceed this limit.

No part of the brick-work comes in contact with the boiler, to injure it, or interfere with the fire-surface and the sweeping of the flues. The tubes of the boiler are large, and can easily be got at to clean, at any time, by lifting the iron lids that cover the top of the boiler and the flue around it.

In buildings where the heating surfaces cannot be conveniently situated below, or where ventilation can be

dispensed with, they can be neatly arranged within the rooms to be warmed, and covered with handsome screens, &c. \* \* \* \* \*

The apparatus is erected by Baker, Smith & Co., who have their office and manufactory at 182 Centre street, where it may be seen in operation. A descriptive pamphlet and a "Treatise on Artificial Warmth and Ventilation," may be had on application, or mailed to any part of the country, free of expense.